CONFIGURABLE FORCE-SENSITIVE INPUT STRUCTURE FOR ELECTRONIC DEVICES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a nonprovisional patent application of and claims the benefit to U.S. Provisional Patent Application No. 62/057,350, filed Sep. 30, 2014 and titled "Zero-Travel Input Structure," the disclosure of which is hereby incorporated herein by reference in its entirety. This application is also related and claims the benefit to U.S. Provisional Patent Application No. 62/057,425, filed Sep. 30, 2014 and titled "Dynamic Track Pad for Electronic Devices," the disclosures of which are hereby incorporated herein by reference in their entireties.

FIELD

[0002] The disclosure relates generally to electronic devices and, more particularly, to a configurable, force-sensitive input structure for an electronic device.

BACKGROUND

[0003] Conventional electronic devices typically include a variety of distinct input devices formed from a variety of components. For example, conventional laptop computing devices typically include a keyboard and a track pad to allow a user to interact with the laptop. Each of these devices includes a variety of components that may be positioned both inside and outside of the casing of the laptop. For example, the keyboard may include keycaps protruding from the casing, and corresponding internal dome switches, electrical contacts and traces positioned within the casing. In order for the keycaps to protrude from the casing and maintain contact with the internal components, keycap apertures are formed through the casing of the electronic device.

[0004] However, conventional input devices, such as keyboards or track pads for a laptop, are susceptible to damage. For example, debris and other contaminants may enter the casing of the electronic device through the keycap apertures and may subsequently damage the internal components of the electronic device. The damage to the internal components may render the electronic device inoperable. Likewise, the mechanical structures forming the input devices may be especially vulnerable to a drop or mechanical shock.

[0005] Additionally, because many conventional input devices have a number of components positioned both inside and outside the casing of the electronic device, the risk of component failure may increase. That is, in combination with some components being positioned on the outside of the casing where a number of components are used to form each of the conventional input devices, if a single component is damaged, lost, or becomes inoperable, the entire input device may become inoperable.

SUMMARY

[0006] An input structure is disclosed. The input structure comprises a metal contact layer defining a dimensionally-configurable input region, a sense layer positioned below the metal contact layer, a drive layer capacitively coupled to the sense layer, a compliant layer positioned between the sense layer and the drive layer, and a rigid base layer positioned below the drive layer, wherein the sense layer and drive layer cooperate to sense an force exerted on the metal contact layer.

[0007] An electronic device is also disclosed. The electronic device comprises a metal casing having a contact portion, and a base portion positioned below and coupled to the contact portion. The electronic device also includes a group of holes formed through the contact portion, and an input structure positioned within the casing and below the group of holes. The input structure includes a sense layer positioned below the contact portion of the metal casing, a drive layer positioned beneath the sense layer, a compliant layer positioned between and coupled to the sense layer and the drive layer, and a set of supports positioned within the compliant layer. The input structure may capacitively detect a force and a location of a force exerted on the contact portion of the metal casing.

[0008] An electronic device is disclosed. The electronic device comprises a metal casing comprising a partially-flexible contact portion, and an input structure positioned below and secured to the partially-flexible contact portion of the casing. The input structure comprises at least one input area formed on a portion of the partially-flexible contact portion. The input structure is configured to provide a group of interchangeable input devices within the at least one input area formed on at least the portion of the partially-flexible contact portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements, and in which:

[0010] FIG. **1**A shows an electronic device including a configurable, force-sensitive input structure, according to embodiments.

[0011] FIG. **1**B shows a top view of the electronic device of FIG. **1**A, according to embodiments.

[0012] FIG. **2** shows a cross-section side view of a stack-up of a force-sensitive input structure of the electronic device of FIG. **1**A, taken along line **2-2**, according to embodiments. The force-sensitive input structure includes a compliant layer formed therein.

[0013] FIG. **3** shows a cross-section side view of a stack-up of a force-sensitive input structure of the electronic device of FIG. **1**A, taken along line **2-2**, according to additional embodiments. The force-sensitive input structure includes deformable compliant supports formed therein.

[0014] FIG. **4** shows a bottom view of a portion of an electronic device including a configurable, force-sensitive input structure and a haptic feedback module, according to embodiments.

[0015] FIG. **5** shows a cross-section side view of a portion of a stack-up of a force-sensitive input structure of the electronic device of FIG. **1**A, taken along line **2-2**, according to embodiments. The stack-up of the force-sensitive input structure is secured within the electronic device in a first configuration, as shown in FIG. **5**.

[0016] FIG. **6** shows a cross-section side view of a portion of a stack-up of a force-sensitive input structure of the electronic device of FIG. **1**A, taken along line **2-2**, according to additional embodiments. The stack-up of the force-sensitive input is secured within the electronic device in a second configuration, as shown in FIG. **6**.

[0017] FIG. **7** shows a cross-section side view of a portion of a stack-up of a force-sensitive input structure of the electronic device of FIG. **1**A, taken along line **2-2**, according to